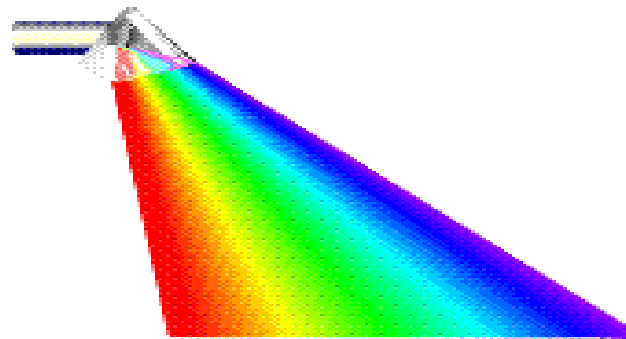


IEC Exploitation of JPEG2000 in JPO2

An Overview



Team-IEC

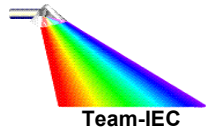
(NTB@LM, Gaithersburg, MD)

(June 4, 2003)

UNCLASSIFIED



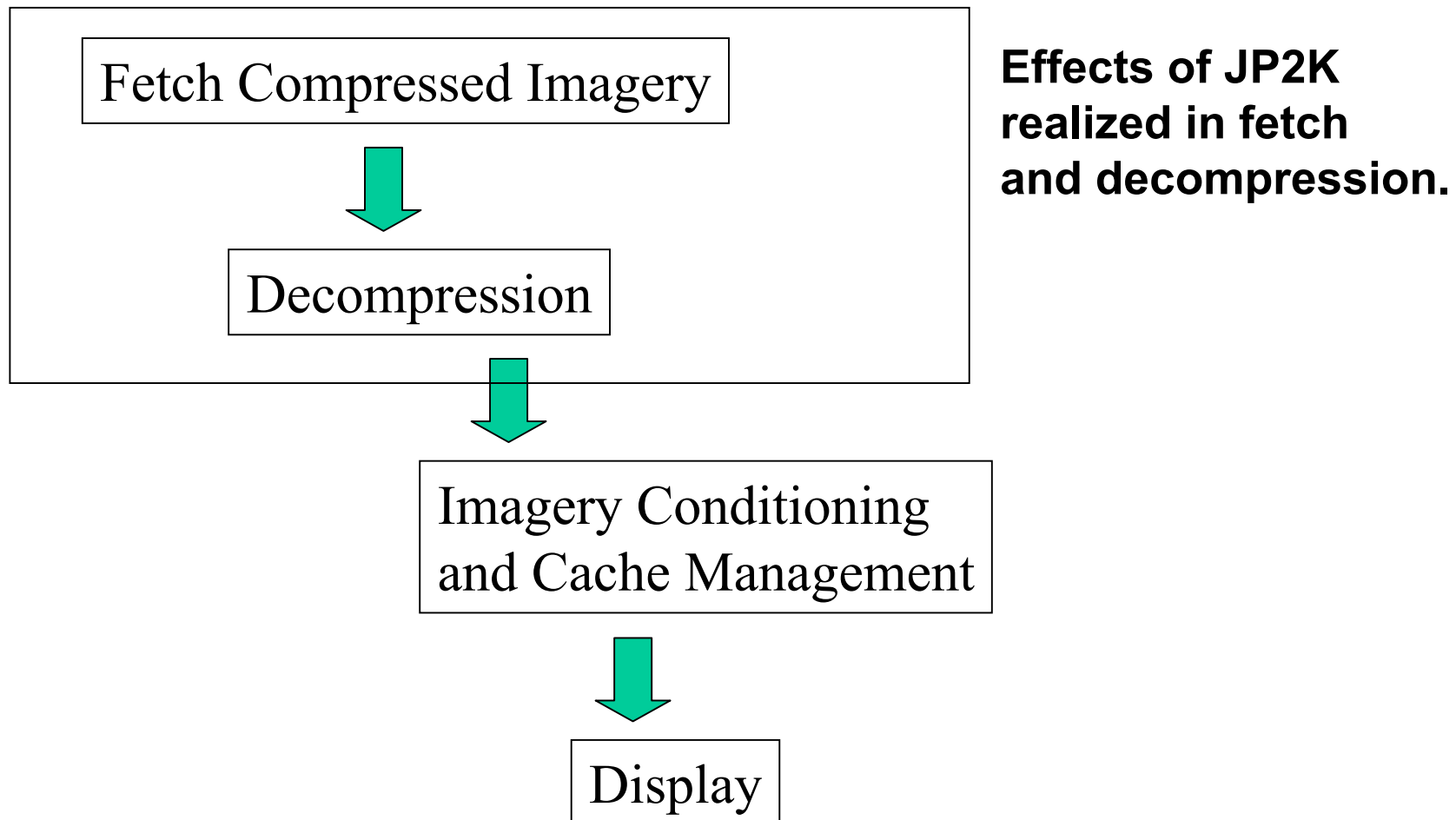
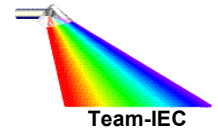
Presentation Topics



-
- **IEC Overview: Exploitation Thread & Requirements**
 - **Goals of the Assessment**
 - **Challenges faced by IEC**
 - **Conclusions**
 - **Discussion**

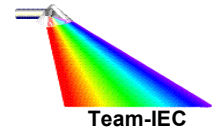


ELT Logical Functionality





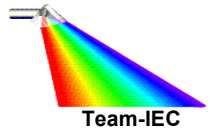
Key IEC Performance Requirements



- **Roam at 480 pels per seconds** on WindowsTM 2000 Workstations in all reduced resolution datasets and in the diagonal, horizontal, and vertical directions.
 - Some users have expressed needs for even faster rates, ~ 750 pels per second
- **Roam** in a **smooth and continuous** manner.
- **Magnify** the entire display in **500 milliseconds** or less (within a given fixed magnification level)
- **Change magnification** from one fixed magnification to another within **2 seconds**.
- Response Time – **image is displayed** and available for exploitation within **10 sec.**
 - Time line includes display of overview image



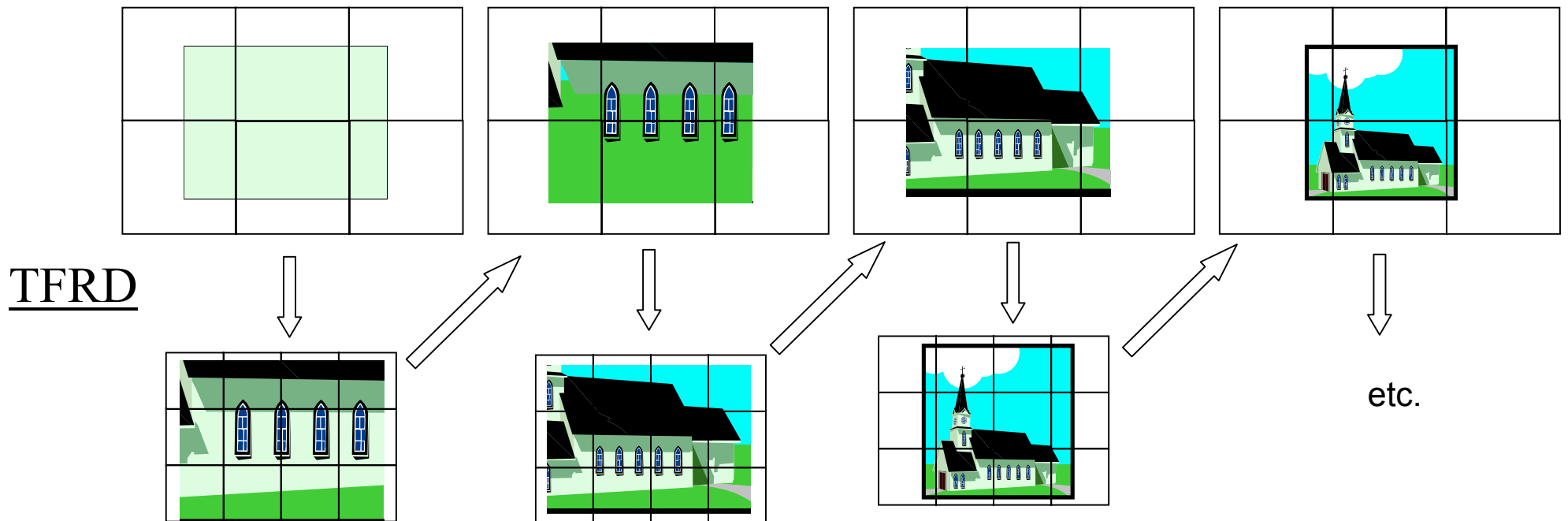
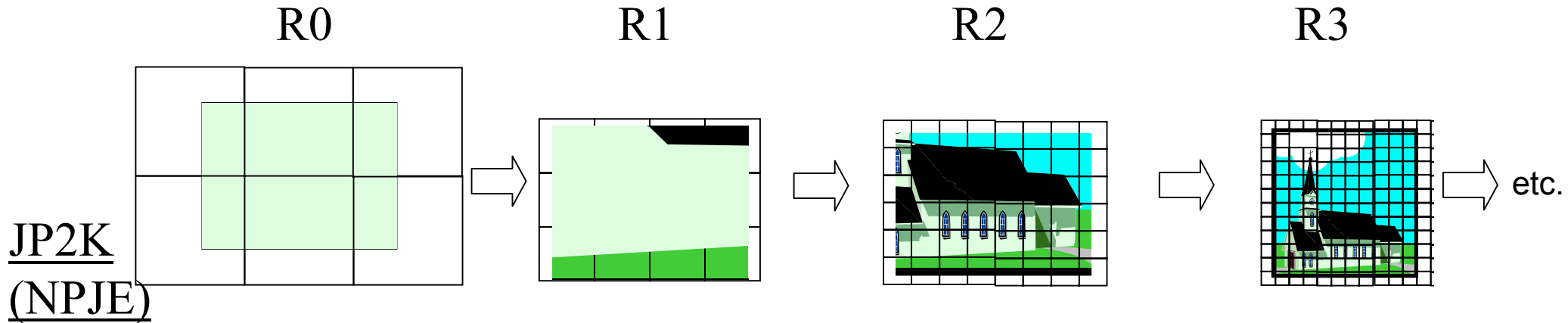
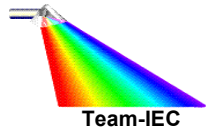
Goals of this Assessment



- Investigate the upper-bound placed on exploitation performance from compressed-imagery fetch and decode operations.
- fetch & decode performance sensitivity to:
 - image size
 - ideally, overview production and roaming are insensitive to image size.
 - JPEG 2000 codestream format
 - progression ordering
 - tiling vs precincts
 - unorthodox adaptations – like RSETS
 - mode of serving compressed imagery (ex: NFS, local disk)
 - requested resolution
 - different decoders
 - compression level (bpp)

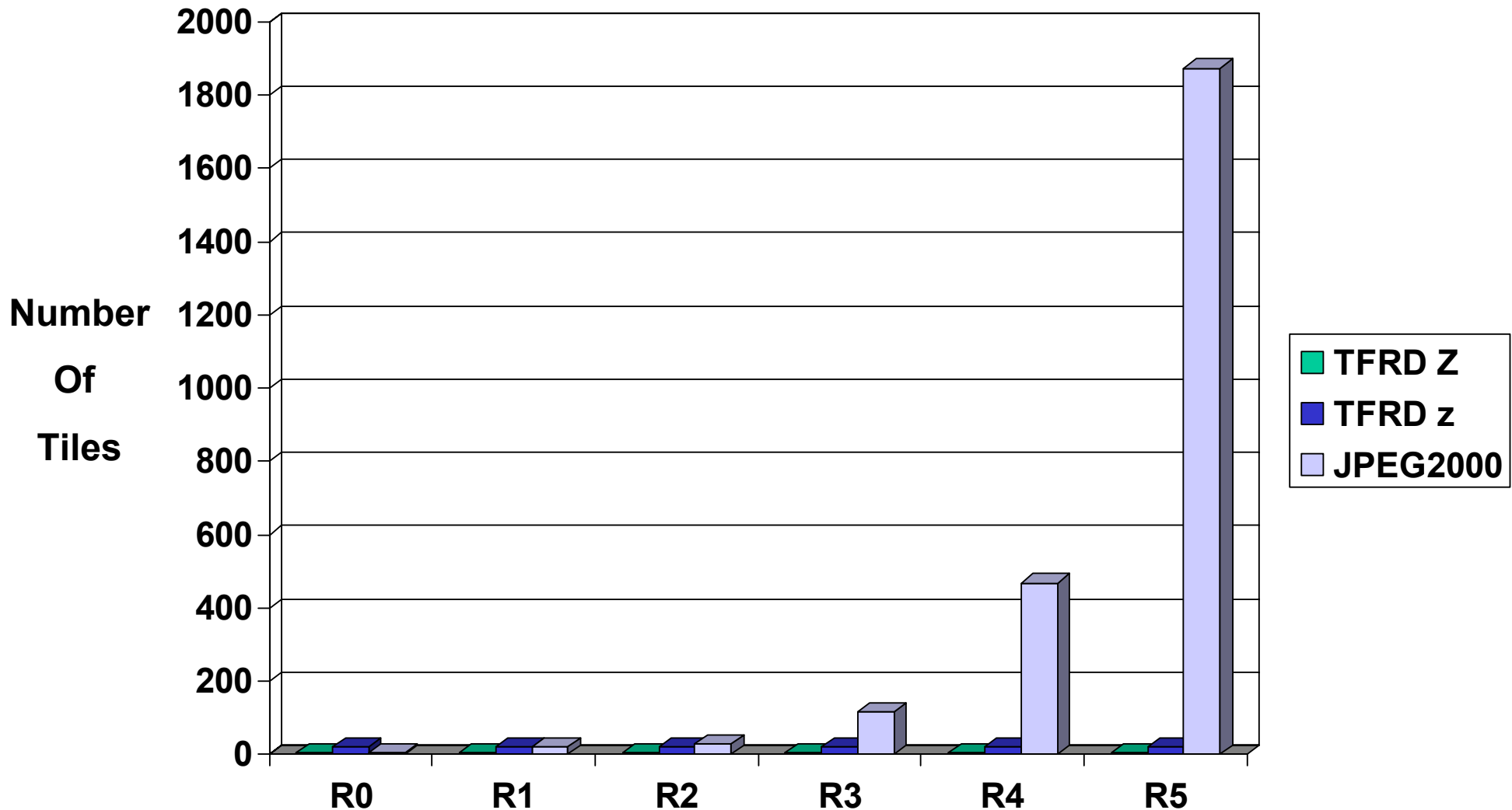
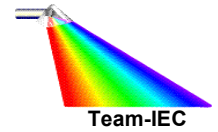


JPEG 2000 (NPJE) vs. TFRD Tiling





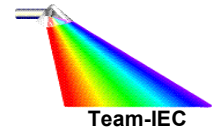
Number of Tiles Needed to Cover the Display



The number of NPJE tiles needed to cover the display increases significantly for lower zoom levels.



JPEG2000 Roam Assessment



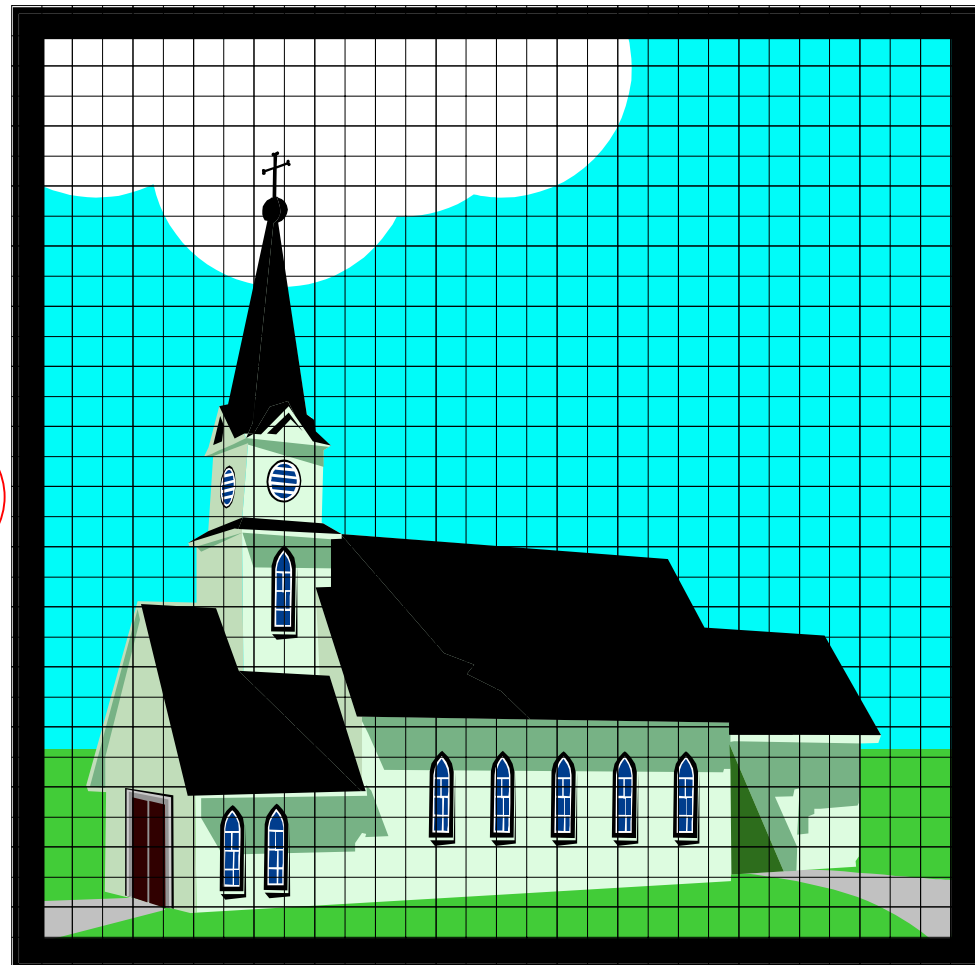
Worst Case Roam as R6 is approached from R5

Roam
direction



- ~ 174 tiles required to progress in roam direction
- ~ 75 compressed imagery fetches per advancement layer
- 480 pels/sec requires
 - 3776 tiles per sec
 - 1655 compressed-imagery fetches per sec

Roaming at low zoom could be I/O limited due to large number of tiles.

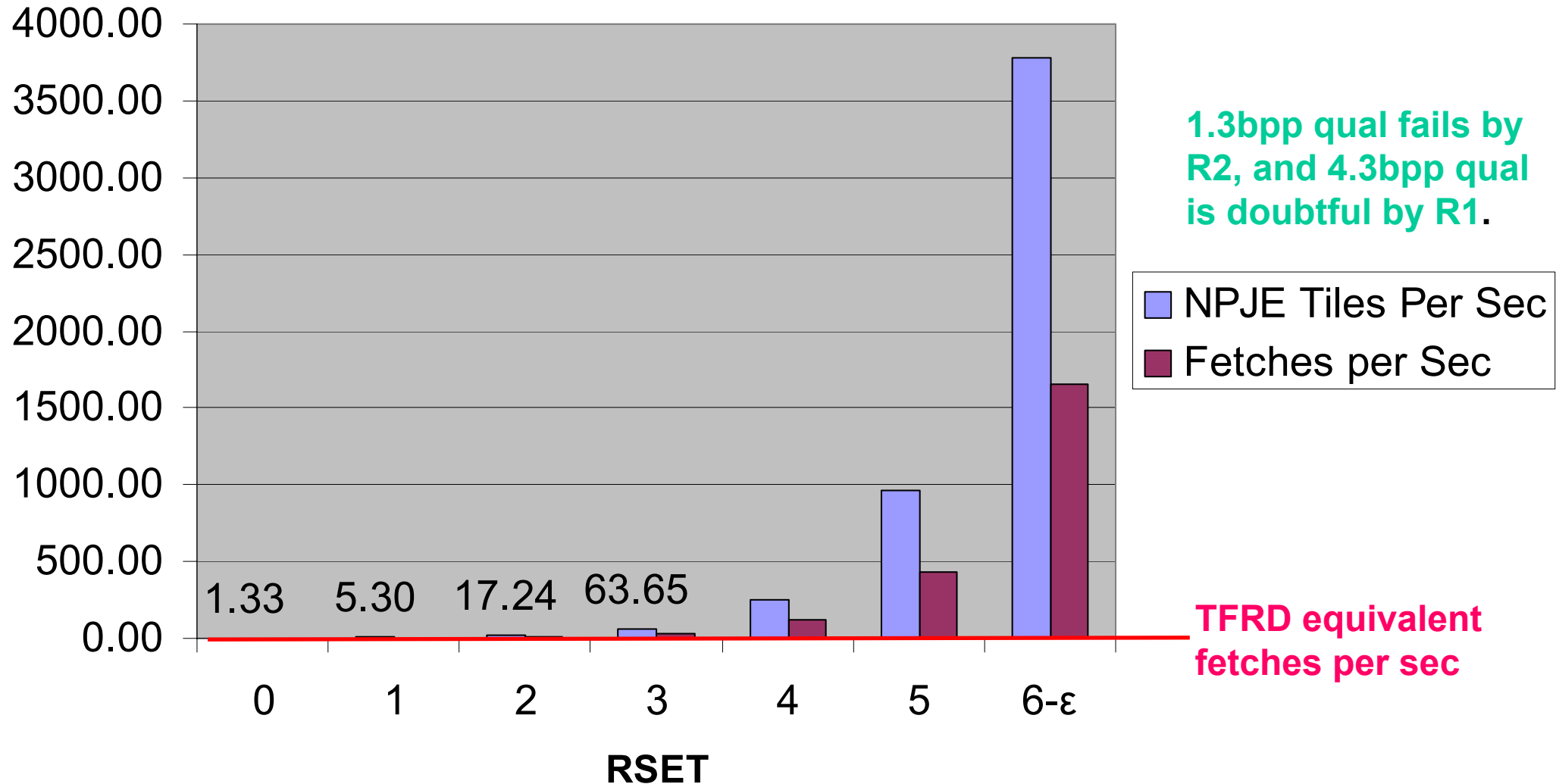
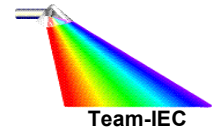


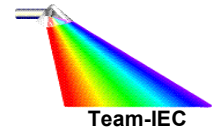
~75
tiles

~100 tiles

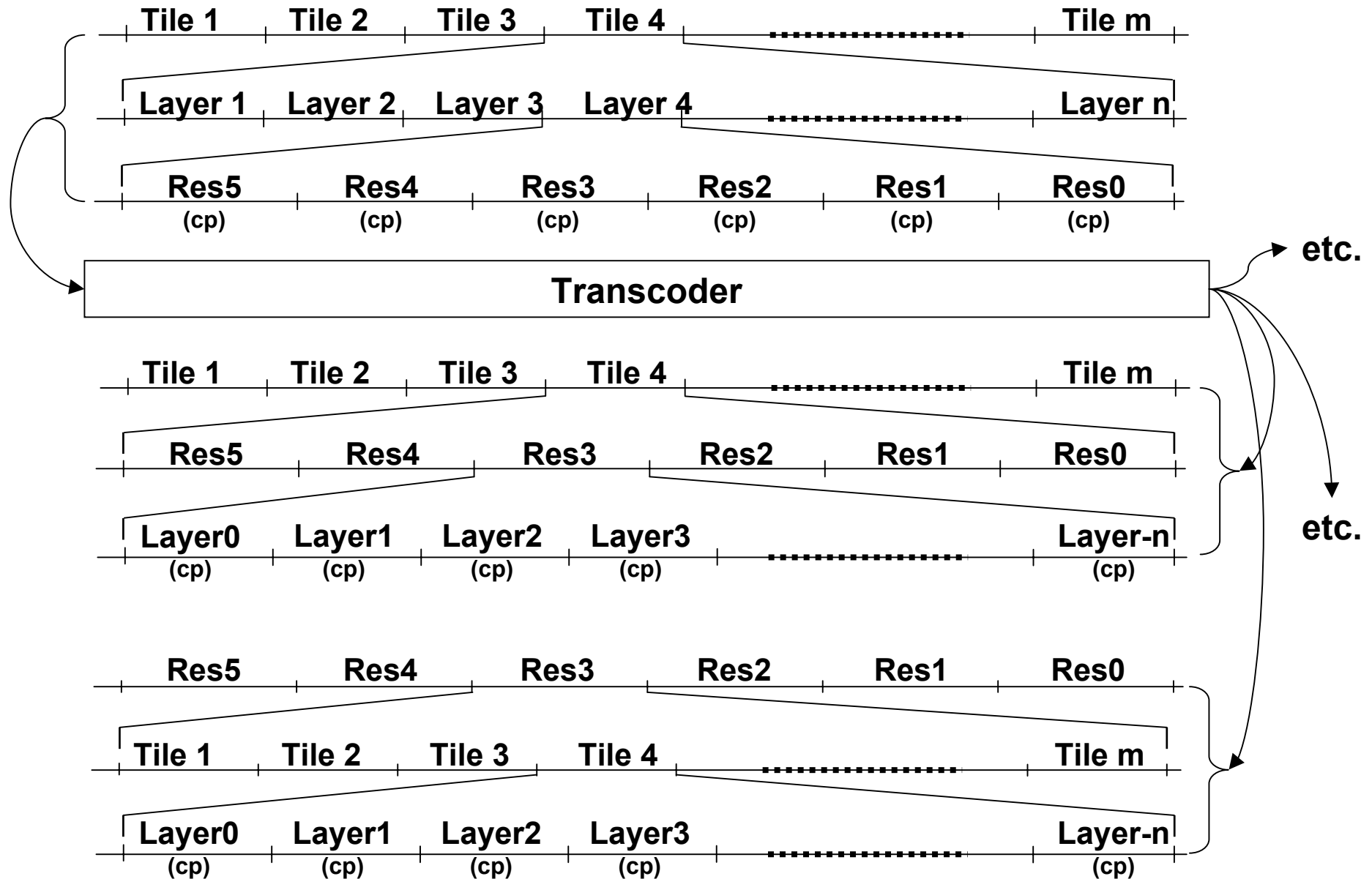


JPEG 2000 Roam (at 480 Pels Per Sec)



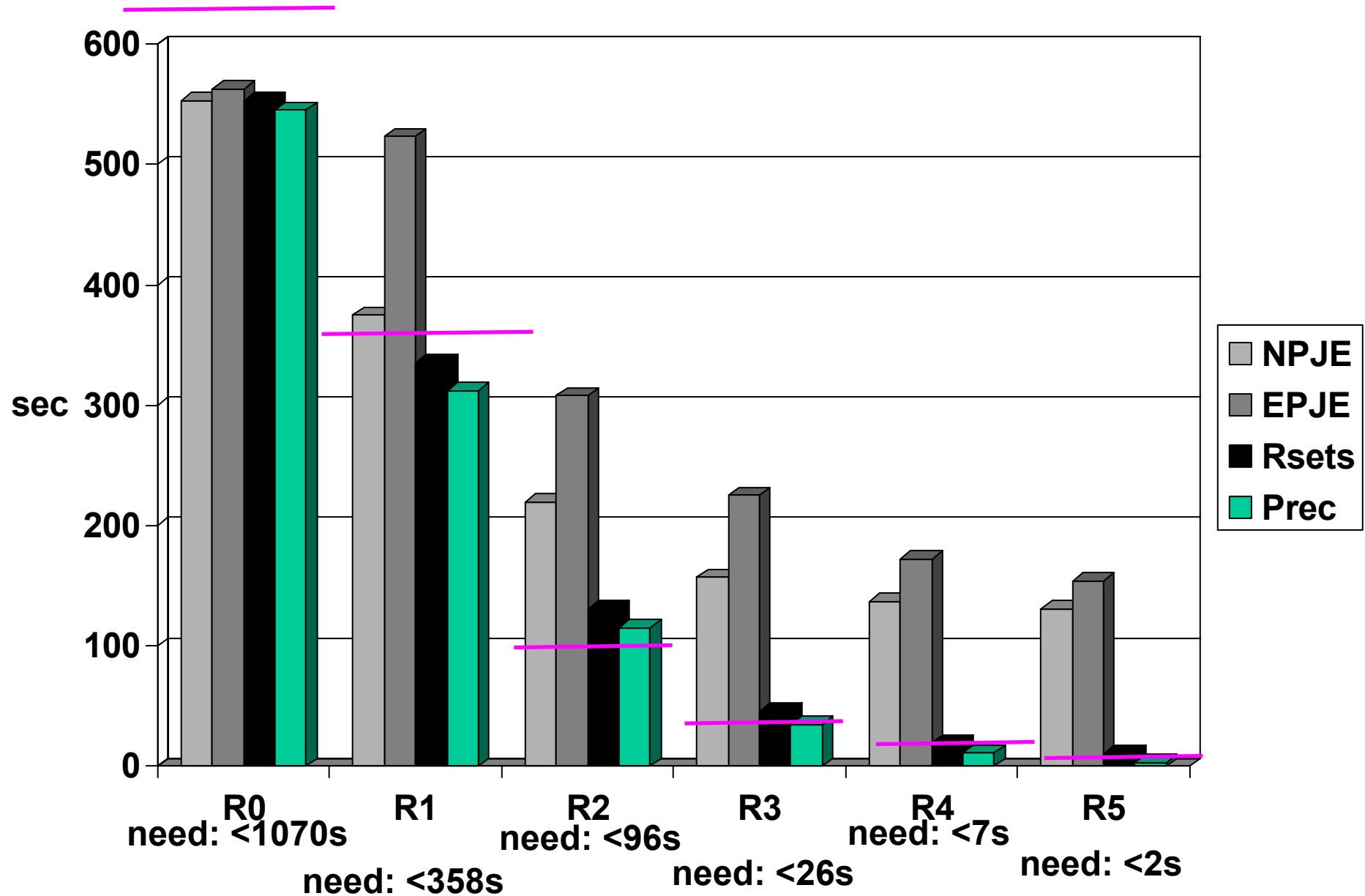
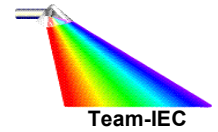


Transcoding and Progression Ordering Example



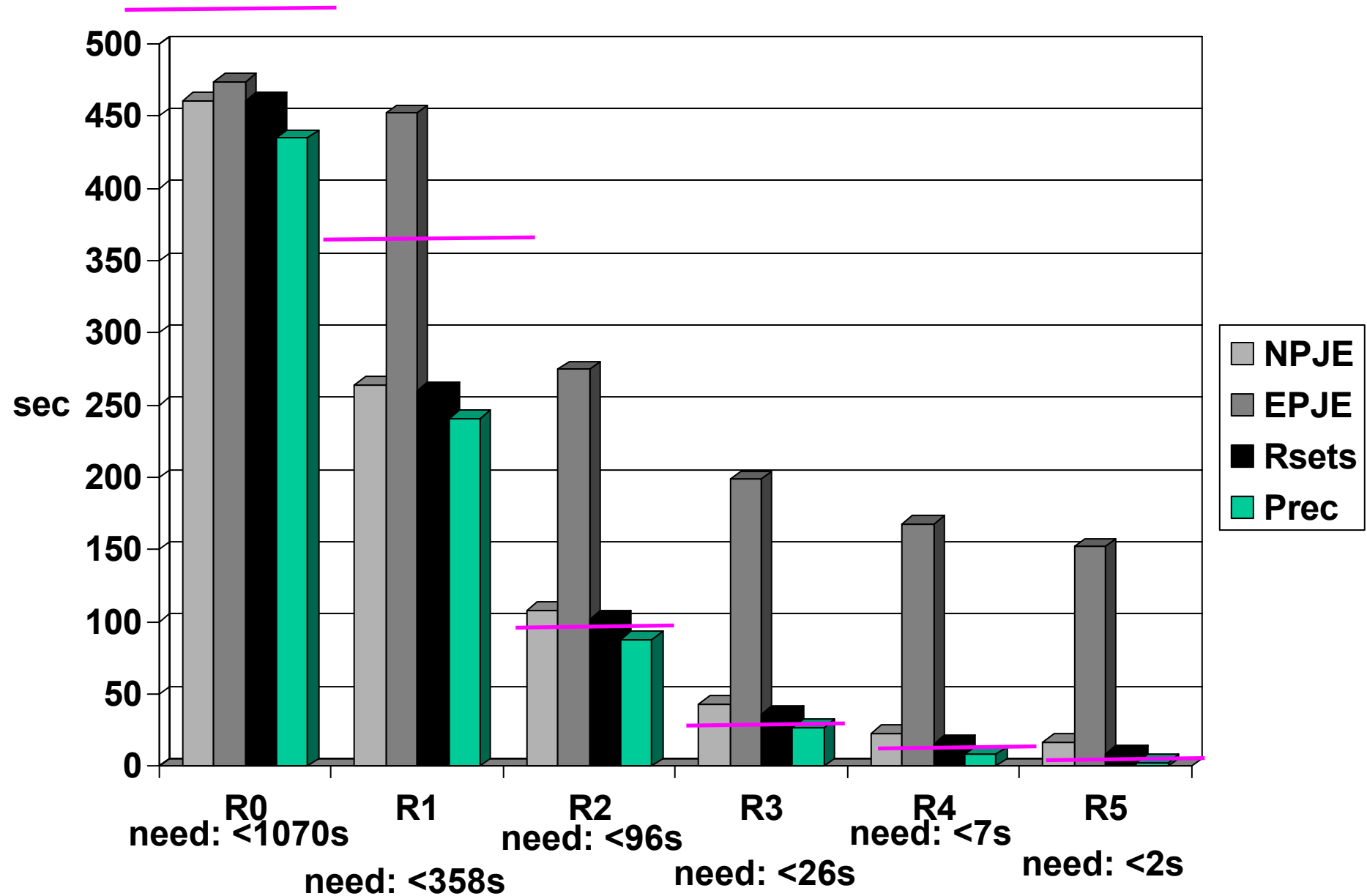
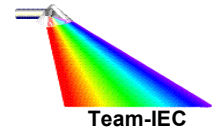


Kakadu Decompression Times: 60K X 60K - DAS



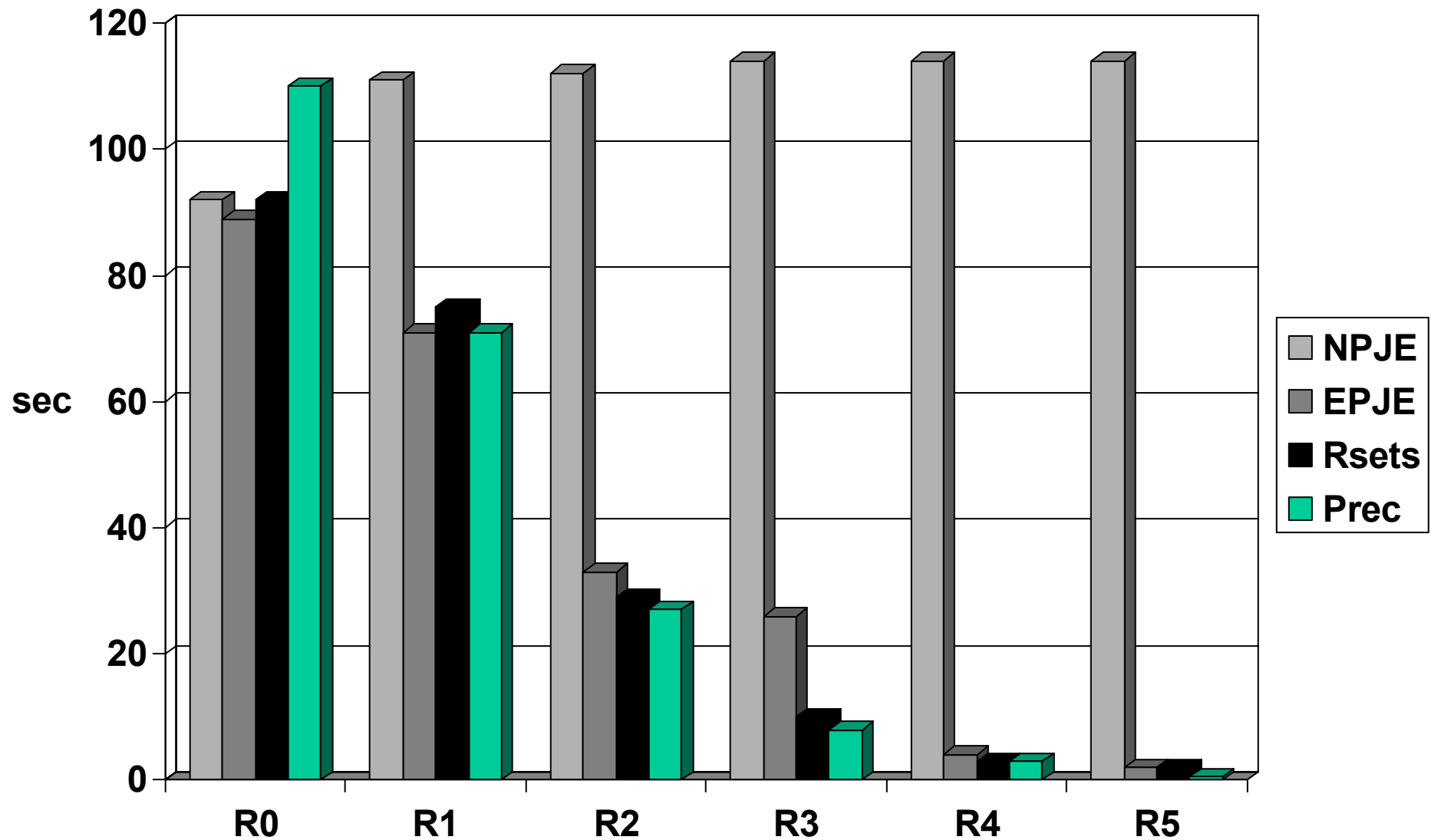
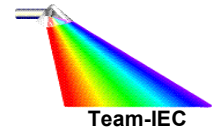


Kakadu Decompression Times: 60K X 60K - Disk



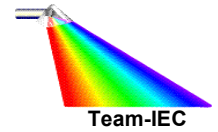


Kakadu Decompression Delta Times 60K X 60K : (DAS based) minus (disk based)





Conclusions



- **Tiling (spatial domain) overhead in JPEG2000 presents performance challenges for low-resolution fetch and decodes.**
 - **fetch of compressed imagery**
 - **decode**
 - **no clear technical solutions, but preliminary results from experiments indicate possibilities**
 - **business case to produce decoder to efficiently handle**
 - **I/O (compressed imagery service from file system vs JPIP)**
 - **decode strategies – large tiled images vs smaller precinct images**
- **Transcoding:**
 - **performance sensitivity to sizing**
 - **determination of optimal Rabc progression ordering**
- **Further investigation is needed – IEC/C JPEG 2000 Assessment will continue with focus on transcoding options**